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Ministry of Labor and Skills

Dariy Products Processing

Level-II


Based on November 2021,Version-3 Occupational Standard

Module Title: Working in a Freezer Storage Room

LG Code: IND DPP2 M05 LO (1-4) LG (21-24)

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Table of Contents

Introduction to the module

This Module cover the skills, knowledge and attitudes required to enter a freezer storage environment, identify and monitor equipment operation in a freezer storage environment and handle frozen product safely.

LG #21	LO #1 Prepare to enter a freezer storage environment

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Identifying Appropriate personal protective tools • Fitting appropriate personal protective tools • Conducting checks and inspections workplace procedures. This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Identify appropriate clothing and footwear • Fit clothing and footwear correctly prior to entering a freezer. • Conduct checks and inspections according to workplace procedures.
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the information Sheets 4. Accomplish the Self-checks 5. Perform Operation Sheets 6. Do the “LAP test”

Information Sheet 1

1.1 Identifying appropriate personal protective tools

Personal Protective Equipment (PPE) is clothing or equipment designed to reduce employee exposure to chemical, biological, and physical hazards when on a worksite. Workers in cold storage environments are at risk of cold stress, making PPE a critical last line of defence against frostbite and hypothermia. Consequently, workers in frozen storage facilities gear should wear clothing, boots, headgear and gloves that protect against the cold. Most importantly, protective clothing should be well-fitted, visible, insulated, water resistant and durable. In addition, workers should have sufficient clothing to always have a spare, clean set available in case they get dirty or wet. Ensure Proper Clothing Layered clothing insulates body heat. Tight clothing restricts blood from reaching the extremities. Advise workers to wear at least three layers of loose clothing, including: • an inner layer made of wool, silk, or a synthetic fabric to keep moisture away from the body. Dressing properly is extremely important to prevent cold stress.

1.1.1 Types of PPE worn in cold and frozen room

Chill environment down to -5℃, 150 gm chill protective clothing including:

- thermal undergarments to personal preference;
- jacket and trousers or quilted all-in-one coverall;
- lightweight gloves;
- Safety boots or shoes; and
- Head protection – baseball cap or safety helmet.

Frozen environment -5℃ and below, 235 gm frozen protective clothing including:

- Thermal undergarments to personal preference;
- Jacket or all-in-one coverall, both with knee protection
- Cold-store gloves with thermal liners;
- Insulated safety boots with thermal socks;
- Safety helmet with thermal liner, thermal balaclava and thermal hood.

Recommended PPE in freezer storage environment

- Head protection equipment
- Face protection equipment
- eye protection equipment
- hand protection equipment
- Foot protection
- Body protection equipment

- **Head protection**

Head protection is required for all employees working in areas where there is potential danger of head injury from impact, electrical shock or burns, or falling or flying objects.

Figure 1.1. Head protection

- **Face and eye protection equipment**

Safety goggles are tight-fitting eye protection that completely cover the eyes, and the facial area around the eyes and provide protection from impact, dust, vapours, and splashes.

Safety goggles can be worn over prescription lenses.

Figure 1.2.Face and eye protection equipment

- **Glove**

Used to prevent potential for hand hazards from chemicals, sharp objects cold temperatures, electricity, germs, and dirt. Gloves should be warm and well-fitted to allow for manual tasks.

Figure 1.3. Glove

- **Foot protection**

Is used to prevent the danger that may occur to the legs and feet from impact, crushed or escaped by hard objects spilling exposure to electricity and should be insulated, water proof and anti-slip,

Figure 1.4. Foot protection

- **Body protection equipment**

Use for protection from dangers from chemical splashes, exposure to extremely cold temperatures, including fire, bumping into hard objects such as heat shield, body pad or bib, etc.

Figure 1.5. Over all PPE

- **The loud noise protection device**

It is an ear protection device worn in or over the ears while exposed to hazardous noise and provide hearing protection to help prevent noise-induced hearing loss. It can also protect against other effects of noise exposure such as tinnitus and hyperacusis. Used for reducing the noise level in the working environment to a safe level before entering the operator's hearing system. This is to prevent hearing loss, such as earplugs and noise reduction and the earmuffs reduce the noise.

Figure 1.6.noise protection

1.2 Fitting appropriate personal protective tools

Correct fit is essential for the correct operation of PPE and must be checked by the user before the task. All PPE should be maintained in a clean and reliable fashion. Employers should take the fit and comfort of PPE into consideration when selecting appropriate items for their workplace. PPE must also be clean and hygienic, a particular concern where it is shared amongst employees, or where dirty equipment could lead to disease or compromise its protective factor.

There are many varieties of protective clothing available for specific hazards. Do not wear PPE that could potentially cause injury, such as loose fitting gloves that could be caught in moving parts of equipment or machinery. The wearer is required to inspect PPE prior to use, for signs of penetration or other damage due to impact, rough treatment or unauthorized alterations which may reduce the degree of safety originally provided.

Figure 1.7.fitting PPE

1.3 Conducting checks and inspections workplace procedures

Follow-up inspections are required where one or more contraventions are found, which are considered to increase the likely risk of contamination of the milk or where improvements have been outstanding to since previous inspections.

Therefore to check:-

- the temperature monitoring system is operating correctly
- Record the temperature readings from Cold room temperature device twice a day
- The finished products need refrigeration, store them between 1°C and 4°C.
- Store frozen products at -18°C or less.
- Storage room temperatures regularly.
- Products that need refrigeration were not packaged between 1°C and 4°C.
- The food Arranged in the proper order for first in, first out (FIFO) item rotation or not.
- Make sure condensate pipes empty into a drain to reduce contamination.
- Be careful about stacking dairy products.
- Keep refrigeration units including their condensate collection trays and drain lines clean and maintained on a regular schedule to prevent the growth of mould, spoilage bacteria and pathogens.
- Listen to the cooling equipment. If you notice any unusual noise, or if the unit seems to be running for longer than normal the contact the technician immediately.

Check inside the room.

- Is the airflow from the evaporator normal?
- Is the evaporator fan running quietly?
- Is there water on the floor? If there is, the evaporator drainpipe may be blocked.

Check ice build-up on the evaporator.

- Check the ice formation on the evaporators.
- Look at the pipes and fins.
- If they are coated with ice more than 6 mm thick the evaporator needs defrosting.

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Choose the best answer (each 2 point)

1. What hazard do safety helmet protect against?
   a. Strong light
   b. Dust
   c. reducing draughts to the head and neck area
   d. All
2. Which one is true about checking work place procedures?
   e. Store frozen products at -18°C or less
   f. store frozen above -18°C
   g. store ice cream at -18 °C or less
   h. store milk at 4 °C

Test II: Short Answer Questions (each 1 point)

1. List personal protective equipment used in frozen storage room?
2. How to check cold room temperature?

Note: Satisfactory rating - 6points Unsatisfactory - below 6 points

1.2. Techniques/Procedures of fitting PPE

A. Tools and equipment

- Glove
- Mask
- Goggles
- Apron/gown
- Safe shoes

B. Procedures/Steps/Techniques

1. When you enter cold room you will be directed to sanitize your hand and Rub your hands together until sanitizer has fully dried about 20 seconds.
2. Put on gown .Check neck and waist ties security
3. Put on mask. place mask over nose and under chin
4. Put on protective eye wear. Put eye protection and adjust to fit
5. Put on glove
6. Wear safety shoes

LAP TEST-1	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 50 minutes. The project is expected from each student to do it.

Task-1 perform fitting PPE

LG#22 LO#2Identify and Monitor Equipment Operation in a Freezer Storage Environment

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying and reporting effects of freezing temperatures
- Monitoring equipment operational order
- Identifying and reporting defect

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify and report effects of freezing temperatures on equipment used
- Monitored equipment to ensure operational order when in use in a freezer.
- Identify and report defects or mal-operation

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 2

2.1 Identifying and reporting effects of freezing temperatures

Clarence Birdseye of Gloucester, Massachusetts (deceased 1956), is credited with being the "Father of Frozen Foods." Using his natural inventiveness, in 1920 he developed the first machine that quickly froze foods either as bulk pieces or in retail size packages. The earliest history of commercial freezing of foods coincides approximately with the advent of mechanical refrigeration in 1880. Meat, poultry, and fish began to be frozen by this method for transportation over long distances.

Refrigeration is the single most important factor in maintaining the safety of milk. Temperature to be maintained in the cold storage is decided on the basis of type of dairy product and duration of storage. Depending on the temperature range, the principal refrigeration system employed with cold storage is divided in two groups as 'chillers' and 'freezers. **Chilling** refers to the rapid cooling of a food product from its manufacturing temperature down to refrigerated or c old temperatures, usually from 1 to 4°C. **Freezing** is one of the oldest and most widely used methods of food preservation, which allows preservation of taste, texture, and nutritional value in foods better than any other method. In the food industry, freezing usually refers to deep freezing, or lowering the temperature of product below -18°C. Some dairy products like ice-cream are always stored in frozen condition i.e. at a deep low temperature.

https://www.youtube.com/watch?v=NipOoVc6cYQmilk chilling (accessed date 19/11/2022)

2.1.2. Effects of freezing temperatures

Freezing of foods is one of the most prominent technologies followed in the Cold Chain, for preservation of foods for longer periods. The freezing process is a combination of the beneficial effects of low temperatures at which microorganisms cannot grow, chemical reactions are reduced, and cellular metabolic reactions are delayed. Food freezing is practiced in various food sectors e.g. milk and milk products (cheese, ice cream, butter, yogurt), etc. Milk is stored at around 4 °C in cold storage while ice cream is stored at -30 ºC. The ice cream should be stored in a deep freezer at -18 to -23°C. Milk must be maintained at a temperature of 45 °F or below. Bacteria in milk will grow minimally below 45 °F. If the conditions are suitable (food, moisture,

warmth), bacteria multiply very quickly and can double in number every 20 minutes. Frozen foods, in general, maintain their colour and flavour better than foods preserved by other conventional methods, but they are still preserved foods and differ from the fresh product in these characteristics, as well as in texture. Nutritionally, freezing retains vitamin values better than other conventional preservation procedures because high temperatures, damaging especially to Vitamins C and B1, are not present.

Ice cream https://www.youtube.com/watch?v=Rb5_l7XagaM

https://www.youtube.com/watch?v=MFI6s3DgK1o&t=613s

2.1.2.1 The role of freezing

- Slow and gradual increase in the size of the casein aggregates
- It extends and ensures their the shelf life
- Retains the longevity of Milk products characteristics,
- active ingredients,
- freshness,
- Nutritive value.
- Frozen foods:
  - ✓ Foods which are maintained at temperatures below -18^{o}C,
  - ✓ To retain their quality shelf life,
  - ✓ Wholesomeness and safety

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Table 2.1.Recommended freezing storage time and temperature for dairy products

Type of Food	Room temperature	Refrigerator at 40°F or below	Freezer at 0°F or below
1. Butter	For1 to 2 days	1 to 2 months	6 to 9 months
2. Cheese, hard - Cheddar, Swiss, block Parmesan, etc.	-	6months (unopened); 3 to 4 weeks (opened)	6 months
3. Cottage or ricotta cheese	Not save	2weeks(un opened); 1week (opened)	Does not freeze well
4. Cream cheese	Not safe	2 weeks	Does not freeze well
5. Ice cream	Not safe	-	2 to 4 months
6. Milk	Not safe	7 days	3 months
7. Sour cream	Not safe	1 to 2 weeks	Does not freeze well
8. Yogurt	Not safe	1 to 2 weeks	1 to 2 months

How to freeze cheese https://www.youtube.com/watch?v=WEIElFEZd-Q accessed date

2.1.2Reporting effects of freezing temperatures

Immediately report changes in refrigerator/freezer operating characteristics to the Device Manager or Facility Coordinator if the Device Manager is unavailable;

Refrigerator Problem

1. Fridge Not Cooling
2. Freezer is Cool, but Fridge Stays Warm

3. Fridge Leaking Water
4. Light Not Working

2.2. Monitoring equipment operational order

2.2.1. Monitoring equipment

It is designed to help maintain suitable environmental conditions in cold storage facilities.

They are suitable for walk-in refrigerators by using some equipment and instruments like, product storage Product carrier equipment, Metal or plastic shelf, hygrometer and Thermometer for temperature check should be safe and clean. The following instruments are some of those available for this:

- Thermometers for monitoring temperatures
- Hygrometer for monitoring humidity

Figure 2.2 Refrigerator storage

2.2.1.1. Temperature monitoring

Thermometer is a device that measures temperature or temperature gradient, using a variety of different principles. Temperature control is a process in which change of temperature of a space (and objects collectively there within), or of a substance, is measured or otherwise detected, and the passage of heat energy into or out of the space or substance is adjusted to achieve a desired temperature. A thermometer must be used to determine the temperature of refrigerated storage units. The temperatures are recorded twice daily on the record sheet from the Food Safety Program. Milk and dairy products should be received at 45°F or lower and cooled to 41°F degrees or lower, within 4 hours. So when dairy items are delivered, check them for the correct temperature and then immediately place them in your refrigerator. All thermometers

should be calibrated regularly (at least annually.)The selection of temperature monitoring equipment should take into account:

- appropriate accuracy and resolution (depends on the construction of the equipment and its use);
- ability to withstand vibrations, shocks or movement (for mobile system);
- coverage of temperature range adequate for quick frozen foods; and
- Need for calibration and periodic checks to ensure proper functioning.
- Ability to withstand vibrations, shocks or movement (for mobile system).

The step of calibrating thermometer

1. Use clean water in breaker
2. Fill the ice in glass
3. Stir the ice very well
4. Immersion the thermometer to touch ice not to glass (5cm in minimum)
5. Wait for 30 seconds before adjusting
6. Thermometer set to zero ^{o}c

Figure 2.3. Thermometer

Temperature control https://www.youtube.com/watch?v=m0Xqs_1-Qk8 (access date 28/11/2022)

Steps in taking temperatures

A method is described below involving either a dial thermometer with stem or a thermocouple (electrical devices for measuring temperature).

1. Open top of case and remove top corner package.
2. Make hole through the case from inside in line with the second layer of product. Use an ice pick or similar tool. Do not use the stem of the thermometer.
3. Place the thermometer or thermocouple in the hole from the outside, so that the end of the stem, the sensing element, is about 3 inches (8 cm) in from the case wall. Make sure the sensing element is held firmly between packages.
4. Place package back in its normal place and close top of case. Do steps 1 to 4 as quickly as possible.
5. Place two or more cases on top to assure contact of stem with packages of product.
6. Read temperature after 5 minutes.
7. Check the accuracy of the thermometer or thermocouple regularly and keep a record of the checks and any recalibrations.
   https://www.youtube.com/results?search_query=temperature+montoring+for+ice+cream+in+freezer (accessed date 20/11/2022)

2.2.1.2. Relative humidly control

Humidity control of air product is important in both short term and long term storages. In order to avoided decay of the product due to associated micro-organisms, the relative humidity of air should be maintained. Dry air may cause weight loss in products, can affect appearance of the products, while very damp air (moist air with high relative humidity) causes growth of micro-organism and various fungal disease. The relative humidity must be high enough to avoid excessive moisture loss from the product. Higher than these values will incarnate decay and lower than these values will result in weight loss.

2.2.2 Cold Storage Types

Cold storages may be classified in different ways as discussed below:

- Classification based on the use
- Classification based on operating temperatures
- Classification based on activities
- Classification based on duration
- Classification based on the construction

1. **Classification based on activities Based on the activities, cold stores can be classified as**
    - Multipurpose cold horse.
    - Specialised cold stores. While specialised cold stores are designed, built and equipped to store only a single type of food product, the multipurpose cold stores are designed and equipped to stores different varieties of food stuff.

2. **Classification based on operating temperatures**
    - Cold storage maintained above 0 ºC
    - Cold storage maintained below 0 ºC. Milk cold storage is maintained above 0ºC while ice-cream cold storage is maintained below 0 ºC.

Classification based on the use of cold store

- Milk cold storage
- Cheese cold storage
- Butter cold storage
- Potato cold storage etc.

The storage conditions to be maintained as well as method of storage for these cold storages vary depending on the optimum storage conditions required for different products. For example, cheddar cheese is stored at around 10 ºC and 90 % relative humidity for ripening of cheese. Appropriate method of storage of product is very important aspect. Racks are required to keep cheese blocks in the cold storages.

3. **Classification based on the time period**.

The cold storages can be classified into two categories, depending upon the time period for which foods are kept. Storages which are used for storing food stuff for a longer period of time.

5. **Classification based on the construction**

- Constructed cold storage
- Walk in cold storage. Mostly cold storage is constructed in dairy building as per the design and layout of the dairy plant. The cold storage is generally constructed by civil work and insulated either by Thermopolis sheets or PUF panels.

3.2.1. Freezing Equipment

The industrial equipment for freezing can be categorized in many ways, namely as equipment used for batch or in-line operation, heat transfer systems (air, contact, cryogenic), and product stability. The rate of heat transfer from the freezing medium to the product is important in defining the freezing time of the product. Therefore, the equipment selected for freezing process characterizes the rate of freezing. All freezers are insulated with materials which have low thermal conductivity such as expanded polystyrene, polyurethane etc. There are three types of mechanical Freezers

1. Cooled air freezer:
2. Cooled liquid freezer:
3. Cooled surface freezer

1. **Cooled air freezer:** Mechanical refrigerator which evaporate and compress a refrigerant in a continuous cycle and use cooled air to remove heat from foods. It includes chest freezer, air blast freezer, fluidized bed freezer etc. Mechanical refrigeration generally refers to any system that uses electrical power to produce chilled air. The chilled air is passed over food continuously and it removes the heat.
2. **Cooled liquid freezer**: These are similar to cooled air freezers but they use cooled liquid to remove heat from foods and include Immersion freezers.

3. Cooled surface freezer: In this type, the surface of freezer is cooled by the refrigerant on which the food is placed for removal of heat. For example Plate freezer, Scraped surface freezer etc.

Cooled air freezers are:

1. **Chest freezer**

In chest freezer, the food is frozen in naturally circulated stationery air at temperature between -20°C to -30°C. Chest freezer takes longer time (3-72 h) for freezing; resulting in loss of product quality. These are not used as such for commercial freezing owing to low freezing rates. Cold stores can be regulated as large chest freezers. These are used to store foods that are frozen by other methods and as hardening rooms for ice cream. Air is circulated by fans for uniform distribution of temperature; however the heat transfer coefficients are low.

Figure 2.4 chest freezer

https://www.youtube.com/watch?v=hPVm62am8Ew access date 28/11/2022

2. Tunnel freezer

In tunnel freezers, the products on trays are placed in racks or trolleys and frozen with cold air circulation inside the tunnel. In order to allow air circulation, optimum space is provided between layers of trolley, which can be moved continuously in and out of the freezer manually or by forklift trucks. This freezing system is suitable for all types of products, although there are some mechanical constraints including the requirement of high manpower for handling, cleaning, and transportation of trays.

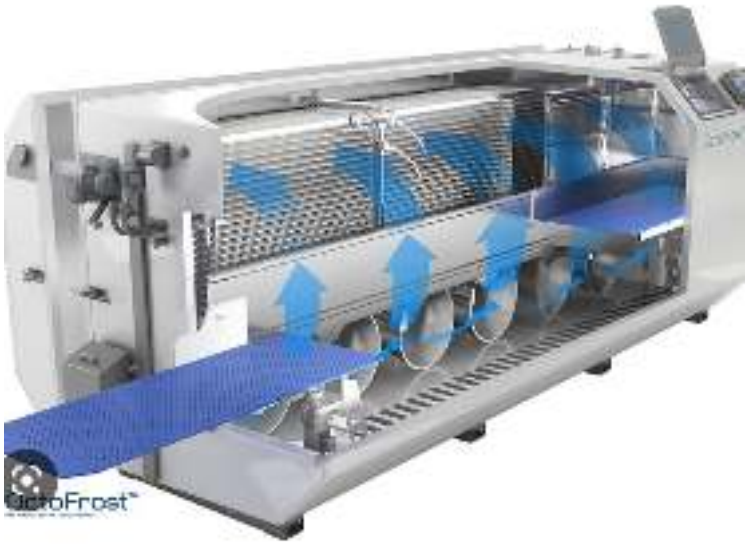

Figure 2.5 tunnel freezer

Tunnel freezer https://www.youtube.com/watch?v=Wo7_BFUT4NQ(accessed date 28/11/22

3. **Air-blast freezers**

Air blast freezing refers to freezing of products in a powerful blast of circulating cold air at a temperature from -18 to -400C under forced circulation. The air blast freezer is one of the oldest and commonly used freezing equipment due to its temperature stability and versatility for several product types. Air is used as the freezing medium in the freezing design, either as still air or forced air. The air is re-circulated over food at a velocity of 1.5-6.0 m/s. The high air velocity reduces the thickness of boundary films surrounding food and thus improves the surface heat transfer co-efficient. For freezing in batch system the foods is stacked on trays in rooms or cabinets. Air flow is either parallel or perpendicular to the food and is directed to pass evenly over all food pieces. Blast freezing is economical and highly flexible for different shapes and sizes of the food. The equipment is compact and has a relatively low capital cost and high throughput (200-1500 kg h-1).

There important points to consider in efficient operation of air blast freezing:

- Air temperature of the freezer should be -10°F (-23°C) or preferably lower. Typically, the temperature is -30 to -40°F (-34 to -40°C).
- Air velocity should be 1,000-2,000 ft/min (305-610 m/min) or higher.
- Product should not be transferred to the still-air storage room until the product has attained 0°F (- 18°C).

Figure 2.6. Air blast freezer

4. Belt freezers

Belt freezers were first designed to provide continuous product flow with the help of a wire mesh conveyor inside the blast rooms. The food is carried up through a refrigerated chamber on the belt. Cold air or sprays of liquid nitrogen is directed down through the belt stack in a counter current flow, which reduces weight losses due to evaporation of moisture. Airflow has good contact with the product only when the entire product is evenly distributed over the conveyor belt. Belt freezers require relatively small floor space and have high capacity. Other features include automatic loading and unloading, low maintenance cost and flexibility to freeze different products. Both packed and unpacked products with variable freezing times (10 min to 3 hr) can be frozen in spiral belt freezers due to the flexibility of the equipment.

Figure 2.7 belt freezer

5. **Fluidized bed freezer**

These are modified blast freezers in which air between -25^{o}C and -35^{o}C is passed at a high velocity (2-6m/s) through a 2-13 cm bed of food, contained on a perforated tray or conveyor belt. The shape and size of food pieces determines thickness of fluidized bed and air velocity needed for fluidization. In fluidized bed freezer, the food comes in to greater contact with the air than in blast freezer and thus all surfaces are frozen simultaneously and uniformly. The use of high air velocity is very effective for freezing unpacked foods, especially when they can be completely surrounded by flowing air, as in the case of fluidized bed freezers. The product zone in the freezer is constructed with stainless steel and food grade plastic for easier maintenance. In some cases, the freezing is done in two stages; firstly the initial rapid freezing to produce ice glaze on food surface, followed by freezing on second belt in beds 10-15cm deep. Small vegetables, french-fried potatoes and fruits like strawberries are some of the products now frozen with this technology.

Figure 2.8. Fluidized freezer

Freezing equipment https://www.youtube.com/watch?v=KuUCTSqzD0E(accessdate 28/11/2022).

3.3. Identifying and reporting defect or mal-operation

2.1.1 Definition of defect

Freeze damage occurs by a number of mechanisms that results in loss of quality in a product after thawing. Loss of quality may be seen in the frozen product, e.g. freezer burn, discoloration, mechanical damage, but in many cases the loss of quality is not noticeable until after thawing and cooking. Most of the mechanisms of quality loss are determined by storage temperature and are accelerated with time spent above the recommended value. They are also promoted by temperature fluctuations. Ice cream, reduced fat ice cream, ice confection and ice cream and ice confection products are particularly heat sensitive and at risk of quality defects due to fluctuating or elevated storage temperatures above -18°C, and should preferably be stored between -22°C and -30°C. The following causes are covered:

- Inside air temperature fluctuates during storage period.
- Inside air temperature is warmer than desired during storage period.
- Inside air temperature is colder than desired during the storage period.
- Inside air temperature is not uniform.
- The storage air smells bad or is difficult to breathe.
- Evaporator coils are icing up and run a lot of condensate.
- Electrical consumption is rising.
- Evaporator pipe leaking
- Low suction pressure
- No liquid/bubbles in sight
- Generator Engine difficult to start
- Alarm does not sound
- Evaporator hot

https://www.youtube.com/watch?v=58YE6RSOOG4 (accessed date 25/11/2022)

Self-check 2	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Choose the best answer (each 2 point)

1. One of the is not role of freezing
   a) It extends and ensures their the shelf life
   b) Retains the longevity of Milk products characteristics,
   c) Inactive ingredients,
   d) all
2. _____is a device that measures temperature of the food.
   a) Lactometer
   b) pH meter
   c) Colorimeter
   d) Thermometer
3. Which one is not store at room temperature
   a. Butter
   b. Ice cream
   c. Ghee
   d. Cheese
   e. All

Test II: Short Answer Questions (each 2 point)

1. What is freezing?
2. What the difference between chilling and freezing ?

Note: Satisfactory rating - 5points Unsatisfactory - below 5 points

Operation Sheet 2

2.3. Techniques/Procedures/ checking storage temperature

A. Tools and equipment

- Thermometer
- Alcohol
- PPE
- Ice/cold water
- Water glass

B. Procedure for cold storage temperature checks

1. Calibrate Thermometer by using ice
2. Fit Compressors with hour meter to record the running duration for each Unit.
3. Use Chlorofluorocarbons (Free Refrigerant Gas)
4. Insert The Probes/ Thermometer
5. Read Temperature After 5 Minutes
6. Record The Temperature
7. Check the accuracy of the thermometer or thermocouple regularly and keep a record of the checks and any recalibrations.
8. Clean and Swipe Thermometer

https://www.youtube.com/watch?v=dI_TSRDAJls

LAP TEST 2	Performance test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 30 minutes. The project is expected from each student to do it.

Task-1. Calibrate the thermometer

Task -2. Take product's temperature measurement

LG #23	LO #3- Handle frozen product safely

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying handling requirements
- Handling of frozen product
- Conducting workplace information

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify handling requirements for frozen product
- Handle frozen product safely as per standard operating procedures.
- Conduct work in accordance with workplace information

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 3

3.1 Identifying handling requirements for frozen product

Cold room is composed of room body, refrigeration unit, evaporator, electric control box, valve, copper pipe, wire, refrigerant and other related necessary materials.

Cold chain is a logistic system that provides a series of facilities for maintaining ideal storage conditions for perishables from the point of origin to the point of consumption.

Food handling is the process of preparing food that is safe for public consumption.

3.1.1 Storage Period for frozen product

Various types of frozen foods have different stabilities in frozen storage depending on how quickly they develop abnormal flavours and whether they discolour easily. Different lots of the same type of frozen food may have different stabilities, depending on many factors including but not limited to the quality of raw material and product ingredients, processing, and packaging materials. Storage life can be extended significantly as storage temperatures become colder. For most products, a temperature of 0 °F (-18 °C) or below is required if storage is expected to exceed 6 months. The following table gives the relative stability at 0 °F (-18 °C) for several types of frozen foods. The storage conditions to be maintained as well as method of storage for cold storage vary depending on the optimum storage conditions required for different products. Appropriate method of storage of product is very important aspect.

Table 3.1. Storage temperature and storage time for some dairy products

Commodity	Storage Temperature	Relative Humidity	Approx. storage time	Average freezing point
Cheese	1.5°C	65 to 70%	-	-2.25°C
Butter	7°C	80 to 85%	2 months	-
Butter	-23° to -20°C	80 to 85%	1 year	-
Cream (Sweetened)	-26°C	-	Several months	-
Skim Milk (Dried)	4°C	-	Several months	-

3.1.2 Follow procedures to handle product to avoid product damage

1. Receive milk at 40°F or less.

Milk delivered at the proper temperature will stay fresher longer. Cold temperatures slow or prevent the growth of the harmless bacteria that cause milk spoilage and also reduce the likelihood of other flavour defects. The warmer milk is allowed to get during deliveries and subsequent handling, the longer it takes to cool it back down to proper storage temperatures.

2**. Store milk between 34°F and 38°F**. Milk stays fresher and tastes best longest, and will often be of good quality beyond the "sell-by date" if maintained at these temperatures. At warmer temperatures, spoilage bacteria are more likely to grow, shortening the practical shelf-life of the product. Keep milk cold at all times; do not display milk unrefrigerated for periods that allow it to warm above the recommended temperatures and always return unused containers of milk promptly to the refrigerator.

3**. Maintain a clean refrigerator or cooler.**

Odors from fruits, vegetables, and/or unclean conditions can pass through milk containers and be absorbed into the milk. Citrus fruit stored in close proximity to milk is often to blame when "chemical-like" off-flavors are detected in the milk. Odors from onions and other strong smelling foods, and even the smell of a dirty cooler, can be easily absorbed. Ideally,

milk should be stored in a separate, clean refrigerator or cooler. If separate storage is not available, segregate milk from other foods that have strong odors.

4. **Protect milk from light.**

Strong sunlight and fluorescent light can cause off-flavors in milk and can also destroy vitamins. Very brief periods in the sun or relatively longer periods in artificial light can result in "plastic-like," "medicinal" or flavors likened to "burnt hair" or "burnt feathers." Longer exposures may result in flavors that resemble old cooking oil or "wet cardboard."

5. **Rotate stocks, use milk promptly.**

Milk received first should be used first ("first-in, first-out"). Place new supplies at the rear of the refrigerator so that stock can be rotated properly and milk will not be held beyond its sell-by date. While properly held milk should still be acceptable at or beyond its sell-by date, milk does not improve with age and will not be as fresh-tasting. Order and rotate stock so all milk is sold and consumed well before its sell-by date, ideally with several days to spare. A useful 'rule of thumb' is the NEVER WARMER THAN rule for any point within the cold chain: -18^{o}C for frozen foods, +4^{o}C for chilled foods. In general, dairy products are pasteurized to eliminate bacteria and make them safe to drink or eat. (Raw milk cheese may be aged 60 days instead of being pasteurized.)

3.1.2.1 Cold Storage Precautions

The following should be avoided in cold storages:

- Fluctuations of storage temperatures
- Storing products beyond recommended time,.
- Improper handling of food product.
- Improper stacking.
- Physical damage should also be avoided.

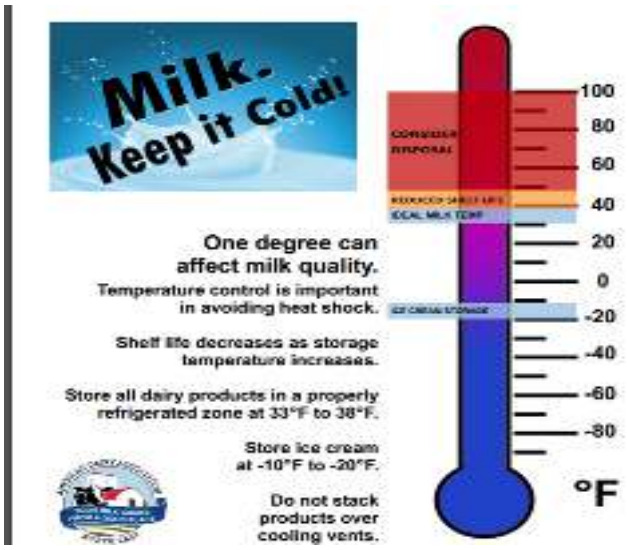

Figure 3.2. Temperature control

Storage temperature for https://www.youtube.com/watch?v=m0Xqs_1-Qk8

3.1.2.1 Types of frozen food

a) Ice-cream.
b) Fish fillets.
c) Pizza.
d) Sausages.
e) Plain chicken.

3.1 Conducting work place communication

Communication is a two-way process involving the following elements: a sender, a message, medium, a channel, a receiver, a response and feedback. Communication in the workplace is important because it boosts employee morale, engagement, productivity, and satisfaction. Communication is also key for better team collaboration and cooperation. Cold Chain businesses must educate their staff of the importance of notifications, and have in place procedures to encourage notifications (e.g. by making it clear that notifications are treated positively and that job security is not threatened by notifications).Monitoring the cold chain requires detailed information on food product temperatures. Temperature monitoring includes both measurement and recording. A detailed Standard Operating Procedure (SOP) for the processing of food as well

as its packaging, despatch and storage will be developed. A standard operating procedure, or SOP, is a living document showing technical instructions of how to perform a routine or repetitive task. SOP aim to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with establishment requirements. The SOP should be based on 5W's & 1H (i.e. why, when, what, where, who & how) A good standard operating procedure – Should provide all information necessary to perform a task Should usually specific to the equipment used for the procedure Should be meticulous Should be standalone Should provide quality information Should provide references

Self-Check –3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. Write the type of frozen food?
2. Define communication?
3. Write frozen temperature of ice cream?
4. What is food handling?
5. What is OHS?
6. Write down the Cold Storage Precautions?

Note: Satisfactory rating - 5 points Unsatisfactory - below 5 points
You can ask you teacher for the copy of the correct answers.

Operation Sheet 3

3.2. **Follow procedures to handle product to avoid product damage**

A, Tools and equipment

- Glove
- Mask
- Goggles
- Apron/gown
- Safe shoes

B, Procedure of handling product

Step 1. Wear appropriate personal protective equipment

Step 2. Keep product at required

Step 3. Store food separately

Step 4. Store food in suitable, covered containers.

Step 5. Avoid refreezing thawed foods.

Step 6. Check and observe the use-by dates on food products.

Step 7. Take special care for perishable foods

LAP TEST-3	Performance Test

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 40 hour. The project is expected from each student to do it.

Task-1 Perform food handling in cold storage

LG #24	LO #4- Respond to emergencies

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Identifying Signs and symptoms of exposure
- Taking appropriate action
- Documenting and reporting constraints and actions taken

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify Signs and symptoms of exposure
- Take appropriate action to minimize effects of exposure of self and others.
- Document and report constraints and action taken to appropriate personnel

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information Sheets
4. Accomplish the Self-checks
5. Perform Operation Sheets
6. Do the “LAP test”

Information Sheet 4

4.1. Identifying Signs and symptoms of exposure

Hypothermia the lowering of core body temperature below 35°C, occurs when the body is unable to produce enough heat to replace heat lost to the environment. When exposed to cold temperatures, your body begins to lose heat faster than it can be produced. Prolonged exposure to cold will eventually use up your body's stored energy. The result is hypothermia, or abnormally low body temperature. A body temperature that is too low affects the brain, making the victim unable to think clearly or move well.

Figure 4.1. Hypothermia

Chilblains is cold injury from repeated exposure of bare skin to wet, windy conditions at temperatures ranging from 15°C to near freezing and although uncomfortable, it causes little or no impairment. Frostbite, damage to tissue caused by overexposure to low temperatures usually involving the toes, nose, ears or fingers can cause injury ranging in severity from quite superficial but painful to frank necrosis.

Figure 4.2. chilblains

Trench Foot known as immersion foot, is an injury of the feet resulting from prolonged exposure to wet and cold conditions. Trench foot can occur at temperatures as high as 60 degrees F if the feet are constantly wet. Injury occurs because wet feet lose heat 25-times faster than dry feet. Therefore, to prevent heat loss, the body constricts blood vessels to shut down circulation in the feet. Skin tissue begins to die because of lack of oxygen and nutrients and due to the build-Up of toxic products.

Figure 4.3 trench

4.1.1. Symptoms of exposure

- **Hypothermia**

Symptoms of hypothermia can vary depending on how long you have been exposed to the cold temperature.

- Slowed pulse and breathing
- Shivering
- Loss of consciousness
- Fatigue

- Loss of coordination
- Confusion and disorientation
- Late Symptoms
- Blue skin

- **Chilblain**

Symptoms of chilblains include:

- Redness
- Itching
- Possible blistering
- Inflammation
- Possible ulceration in severe cases

- **Frostbite**

Symptoms of frostbite include:

- Reduced blood flow to hands and feet (fingers or toes can freeze)
- Numbness
- Tingling or stinging
- Aching
- Bluish or pail, waxy skin

- **Trench foot**

Symptoms of trench foot include:

- Reddening of the skin
- Numbness
- Leg cramps
- Swelling
- Tingling pain
- Blisters or ulcers
- Bleeding under the skin

- Gangrene (the foot may turn dark purple, blue, or gray).

4.2. Taking appropriate action

Everyone should be trained in the workplace's safe work policies, procedures and practices, including emergency response. Training requirements should also be reviewed and updated when new items of plant are introduced or when personnel change. The level of supervision required should take into consideration the hazards, level of exposure, integrity of control measures in place and workers' experience. In workplaces where safe work procedures and worker training and instruction are the primary risk control measures are:

- Do not allow the patient to eat or drink stimulants.
- Reducing worker exposure to the cold, where possible – consider using upright or deep freezers instead of walk-in cold rooms
- Periodic checks to ensure clear access to emergency exit maintained, and that door is operational.
- Give the alert patient warm liquids at a slow rate. When warm fluids are given too quickly, the patient's circulation patterns change.
- Ensuring walk-in cold rooms' internal door opening mechanisms are in good working order and are regularly maintained and tested.
- Ensuring walk-in cold rooms have emergency alarm buttons fitted and regularly tested so that anyone trapped inside can send for help
- Using slip-resistant floor surfaces to reduce slip hazards
- Maintaining good housekeeping practices when stacking and storing items to remove trip hazards
- Ensuring adequate lighting is provided for the tasks in the work space

- Using a buddy system to provide an immediate support in the event of an emergency and avoiding people working in isolation
- Having emergency response procedures in place with appropriate training and regular test drills
- Always maintain air circulation in coolers and freezers.
- Keep storage areas free from rodents, insects, and pests.
- Keep shelves clean and dry.
- Refrigeration units should drain or evaporate condensate.

Take action to response https://www.youtube.com/watch?v=SrcDzZXlwRM

4.3 **.Documenting and reporting constraints and actions taken**

Documents shall be done for a time period that is consistent with the requirements for the manufacturing records. Manufacturers and producers must include in product documentation a contact person for Cold Chain queries and notifications, and can also indicate in the documentation what initial measures can be taken if the Cold Chain is broken to minimize any further damage to the products.The record sheet should include:

- Temperature log of the environment in which the food is transported, stored or handled (e. g the varied internal temperatures of refrigerated transport) and
- how that log was generated; and
- The temperature of the food on delivery and how it was determined.
- The date of production/batch number (if a number of batches of the same type of cheese are made the same day),
- The name of the product
- The type of milk (from which species, if more than one sort of milk is used),
- Dosage of starter culture (which type if this varies) and of rennet,
- Type and dosage of mould spores used, if any,

https://www.youtube.com/watch?v=BYdCp3M7Pfs

Self-Check – 4	Written test

Name……

…… ID…… Date…….

Directions: Answer all the questions listed below.

Test I: Short Answer Questions

1. List component of recording
2. How correction action is undertaken?
3. What are sign due to cold room severity?
4. What are control measures to reduce disease facing due too cold storage

You can ask you teacher for the copy of the correct answers.